

REMARKS

Favorable reconsideration of this application in light of the above amendments and the following remarks is respectfully requested.

Claims 1, 4-11, 13-15 and 17-21 are pending in this application. Claims 1, 5-11, 14-15 and 17 are amended herein. Claims 2-3, 12 and 16 are canceled herein. Claims 18-21 are newly added.

Claims 1 and 11 are amended in part to provide greater clarity. Claims 7-8 and 17 are amended back to their original form. Claims 5-6, 10 and 14-15 are amended to provide proper antecedent correspondence. Support for amended claim 9 and new claims 18-21 is found within claims 7-8, 11 and 13.

Claim Rejections - 35 U.S.C. § 103

1. The Examiner has rejected claims 1-4, 6, 9-13 and 15 under 35 U.S.C. § 103(a) as being unpatentable over Kanata (U.S. Patent No. 5,667,923) in view of Hirayanagi (U.S. Patent No. 6,180,289).

Kanata (abstract and cover figure) teaches a direct write charged particle beam exposure method for exposing a resist layer. The method divides exposure patterns into small regions. Charged particle beam exposure doses within the small regions are adjusted to compensate for backscattering from a patterned layer underlying selected portions of the resist layer.

Hirayanagi (abstract and cover figure) teaches a projection microlithography mask and mask substrate separate therefrom. The projection microlithography mask and mask substrate may be employed with a charged particle beam exposure method.

The Examiner reads Kanata onto applicant's foregoing claims and further concludes that Kanata teaches most elements in applicant's foregoing claims to applicant's invention. However, the Examiner acknowledges that Kanata does not teach a charged particle beam method employing a series of adjacent fractured pattern elements when forming a contiguous latent pattern, where an adjacent pair of pattern elements is separated by a gap. Rather, the Examiner cites Hirayanagi as teaching that limitation of applicant's invention. In particular, the Examiner cites that a gap is formed by Hirayanagi's retention member as disclosed at Fig. 1c and col. 2, lines 5-10.

The Examiner notes that the foregoing references are analogous art since they are drawn to charged particle beam methods. The Examiner also asserts that it would have been obvious "to use the mask of Hirayanagi in the method of Kanata, as the mask of Hirayanagi can be employed without direct writing which allows for relatively high wafer throughput and decreased costs." The Examiner also predicates reasonable expectation of success in using the mask of Hirayanagi, "as Kanata [at col. 3, lines 20-22] teaches that the charged particle beam method is performed with a mask."

In response in a first instance, applicant notes that within proper context, Kanata at col. 3, lines 20-22 probably does not teach that "[a] charged particle beam method is performed with a mask," as asserted by the Examiner. Rather, Kanata at col. 3, lines 20-22 specifically teaches "a block exposure method which copies a repetition of complex patterns

formed on a mask collectively. . . .” Applicant thus understands Kanata at col. 3, lines 20-22 to teach that a block exposure method exists for proximity effect correction within direct write charged particle beam exposure methods. The block exposure method copies a repetition of complex patterns on a mask. However, there is no indication within Kanata that a mask is physically employed as an optical element within a direct write charged particle beam exposure method such as Kanata’s method. Rather the mask is employed as a data source for complex patterns, repetitions of which are copied within the block exposure method. Thus, within proper context, Kanata does not apparently teach that “[a] charged particle beam method is performed with a mask.” In addition, any of the Examiner’s assumptions or conclusions predicated upon that interpretations of Kanata are worthy of scrutiny since they may be inaccurate.

In response in a second instance, applicant has previously amended claim 1 and claim 11 to incorporate therein a limitation that applicant believes to assist in distinguishing applicant’s invention from that which is taught within Hirayanagi. In particular, applicant has previously amended claim 1 and amended claim 11 to claim that applicant’s charged particle beam method is a direct write charged particle beam method. Support for this limitation newly incorporated into claim 1 and claim 11 is found within applicant’s specification at paragraph 0034. Within paragraph 0034, a person skilled in the art would understand that shaped electron beams, raster scanning methods and vector scanning methods as applied to electron beam methods are implicitly descriptive of direct write electron beam methods.

Given the foregoing limitation previously incorporated into claim 1 and claim 11, applicant asserts that Hirayanagi may not properly be employed for rejecting any of applicant’s claims to applicant’s invention since Hirayanagi, when considered in its entirety, teaches away from applicant’s claimed invention. MPEP 2141.02. In particular, applicant’s claimed invention

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is directed towards a direct write charged particle beam exposure method while Hirayanagi's invention (title and abstract) teaches a masked projection lithography method which may employ charged particle beam radiation. Since direct write charged particle beam methods typically inherently do not employ a mask as an optical element, while projection lithography methods do employ a mask as an optical element, Hirayanagi teaches away from applicant's claimed invention with respect to the presence of a mask as an optical element within a charged particle beam method. Given that Hirayanagi thus teaches away from applicant's claimed invention with respect to the presence of a mask as an optical element within a charged particle beam method, applicant asserts that Hirayanagi may not properly be employed in rejecting any of applicant's claims to applicant's invention.

The "prior art must be considered in its entirety, including disclosures that teach away from the claims." MPEP 2141.02 (paraphrasing *W.L. Gore & Associates, Inc. v. Garlock, Inc.* (citation omitted))

Finally, in response in a third instance, applicant also asserts that there is no suggestion or motivation for modification or combination of Kanata with Hirayanagi in the fashion as suggested by the Examiner, nor any reasonable expectation of success of such modification or combination, since the Examiner's proposed modification changes the principle of operation of Kanata. MPEP 2141.01, 2141.02.

Specifically, applicant again notes that applicant's claimed invention and Kanata's disclosed invention each teach direct write electron beam methods. In comparison, Hirayanagi's disclosed invention teaches a projection lithography method that employs a mask, and that may employ charged particle beam radiation. Since Kanata teaches a direct write

charged particle beam method, Kanata inherently has no need for Hirayanagi's fractured pattern element mask and retention member since within a direct write method charged particle beam exposure locations are defined employing a scanning of a charged particle beam source with respect to a substrate, rather than by a mask. Thus, the incorporation of Hirayanagi's fractured pattern element mask and retention member into Kanata's direct write charged particle beam would change the principle of operation of Kanata's direct write charged particle beam method. Such a mask if employed within the context of Hirayanagi's invention would serve a masking function that is provided within Kanata's invention by a selective scanning of a charged particle beam with respect to a substrate.

"If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious." MPEP 2143.01 (citing *In re Ratti* (citation omitted)).

Since the modification or combination of Kanata with Hirayanagi as suggested by the Examiner would change the principle of operation of Kanata from a purely direct write charged particle beam method absent a mask to newly include a mask that would instead provide a function intended by the direct write method, applicant asserts that there is no suggestion or motivation for modification or combination of Kanata with Hirayanagi. For the same reason relating to a change in the principle of operation of Kanata, applicant also asserts that there is no likelihood of success of the combination of Kanata with Hirayanagi.

Given the absence of suggestion or motivation for modification or combination of Kanata with Hirayanagi, and the unlikelihood of success of such combination, applicant asserts

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that none of applicant's claims to applicant's invention may properly be rejected under 35 U.S.C. § 103(a) as being unpatentable over Kanata in view of Hirayanagi.

In light of the foregoing responses, applicant respectfully requests that the Examiner's rejections of claims 1-4, 6, 9-13 and 15 under 35 U.S.C. § 103(a) as being unpatentable over Kanata in view of Hirayanagi be withdrawn.

2. The Examiner has rejected claims 5 and 14 under 35 U.S.C. § 103(a) as being unpatentable over Kanata in view of Hirayanagi and further in view of Ausschnitt (U.S. Patent No. 5,629,772).

Ausschnitt is cited as teaching a positive photoresist. The Examiner acknowledges that the same is absent within Kanata in view of Hirayanagi. The Examiner rationalizes suggestion or motivation for modification or combination of Kanata in view of Hirayanagi with Ausschnitt upon Ausschnitt's teaching "that it is common in the art to use both negative and positive resists in lithographic exposure processes."

In response, applicant predicates patentability of claims 5 and 14 upon their dependence upon claims 1 and 11.

In light of the foregoing response, applicant respectfully requests that the Examiner's rejections of claims 5 and 14 under 35 U.S.C. § 103(a) as being unpatentable over Kanata in view of Hirayanagi and further in view of Ausschnitt be withdrawn.

Response to Arguments

The Examiner in a first instance asserts in comparison with Hirayanagi that applicant's "claims do not recite limitations drawn to [a] gap being in the same plane as the pattern elements." In a second instance, the Examiner also asserts that applicant's fractured pattern elements and gap are apparently not claimed as being "present within applicant's contiguous latent pattern in the blanket resist layer, as recited in claims 1 and 11."

In response, applicant notes that within claim 1 and claim 11 applicant claims "a direct write charged particle beam method to expose the resist layer to form a contiguous latent pattern within the exposed resist layer, wherein the contiguous latent pattern comprises a series of adjacent direct write fractured pattern elements and at least one adjacent pair of the series of adjacent direct write fractured pattern elements is separated by a gap" Thus applicant believes that applicant's claims are in fact at least implicit if not explicit with respect to a charged particle beam unexposed gap at the same plane as a pair of charged particle beam exposed fractured pattern elements within a contiguous latent pattern within a charged particle beam exposed photoresist layer. Applicant also asserts that it is at least implicit or inherent within applicant's disclosure that a "gap" within applicant's charged particle beam exposed blanket resist layer is an unexposed portion thereof, since the same separates at least one adjacent pair of direct write charged particle beam shot fractured pattern elements within a contiguous latent pattern within applicant's charged particle beam exposed blanket resist layer.

In a third instance, the Examiner asserts that "nowhere in Kanata is it disclosed that direct writing is required as the exposure method." Thus, the Examiner presumably implicitly rebuts applicant's assertion that there is no suggestion or motivation for modification

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or combination of Kanata with Hirayanagi since applicant asserts that Kanata does in fact require direct writing while Hirayanagi does not.

In response, applicant notes that Kanata at col. 9, lines 5-7 teaches that “[t]he exposure intensity of resist film . . . changes according to the presence of the lower level pattern.” Kanata at abstract and cover figure also teaches that “[a]n irradiation energy on each small region [of resist film] is determined by taking backward scattering from lower level pattern into account.” Thus, it is at least inherent or implicit if not explicit within Kanata that Kanata must use a direct write method for exposing a blanket resist layer, since: (1) Kanata teaches individually tailored charged particle beam exposure energies for discrete individual locations within a blanket resist layer as calculated predicated upon presence or absence of an underlying layer; and (2) applicant asserts that a person skilled in that art would be simply unaware of any alternative method for individually tuning an exposure energy for specific locations within a blanket photoresist layer when photoexposing the blanket photoresist layer but by a direct write method.

In light of the foregoing responses, applicant continues to assert that applicant’s claims to applicant’s invention may not properly be rejected under 35 U.S.C. § 103(a) as being unpatentable over combinations of references that include Kanata in view of Hirayanagi.

Allowable Subject Matter

Claims 7-8 and 17 contain allowable subject matter. Claim 16, while also containing allowable subject matter, is now canceled.

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Other Considerations

Applicant has newly added claims 18-21. Support for new claims 18-21 is found within claims 7-8, 11 and 13. The Examiner has cited no additional prior art of record not employed in rejecting applicant's claims to applicant's invention. No fee is due as a result of this amendment and response.

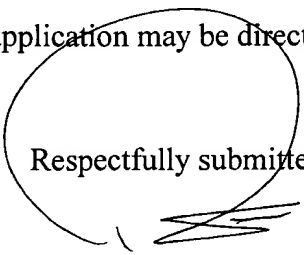
SUMMARY

Applicant's invention as disclosed and claimed within claims 1 and 11 is directed towards a method for forming a patterned resist layer or a method for forming a photomask. Each of the methods employs a charged particle beam exposed resist layer having a contiguous latent pattern formed employing a series of adjacent fractured pattern elements, at least one pair of which is separated by a gap. The methods are direct write charged particle beam methods and the series of adjacent fractured pattern elements are direct write charged particle beam shot fractured pattern elements. The same are absent within the prior art of record. Also absent is a suggestion or motivation to combine the prior art to provide the applicant's invention.

CONCLUSION

On the basis of the above amendments and remarks, reconsideration of this application, and its early allowance, are respectfully requested. Any inquiries relating to this or earlier communications pertaining to this application may be directed to the undersigned attorney at 248-540-4040.

Respectfully submitted,


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